Functioning and participation of students with ADHD in higher education according to the ICF-framework, a systematic literature review

30/06/2014

Young adults with ADHD in higher education, symptoms classified according to the ICF framework, a systematic literature review

Abstract

Due to an increasing number of students with ADHD in higher education and the difficult course of their academic career, a comprehensive overview of participation and functioning of this group is needed. A comprehensive search was performed in MEDLINE (PubMed), EMBASE, CINAHL and ERIC electronic databases in June 2014. This systematic literature review synthesizes 22 articles. Most selected articles focused on body functions and structures (n=16). If we want to support students with ADHD in higher education (e.g., by implementing effective accommodations), it is important to take into account characteristics of the individual student as well as the environment.

Keywords: Functioning, participation, disability, systematic review, ADHD, Higher Education, ICF

Introduction

Attention-Deficit/Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder and is defined in the Diagnostic and Statistical Manual of mental disorders (DSM-5; American Psychiatric Association [APA], 2013) as a relatively stable pattern of impairing symptoms of inattention, hyperactivity and/or impulsivity. This pattern of ADHD symptoms must be pervasive and occur in at least two settings for instance at home and in school. The ADHD phenotype is multi-factorial determined by genetic, biochemical, environmental and social factors. In other words, ADHD is a complex genetic-neurobiological disorder that interacts with the environment (Daley & BirchWood, 2006).

In the past decades, there has been growing interest in the persistence of ADHD from childhood into adolescence and adulthood (e.g., Seidman, 2006; Barkley, Fischer, Smallish, & Fletcher, 2002; Biederman, Petty, Evans, Small, & Faraone, 2010). Research has shown that there is a lack of functional remission of ADHD symptoms (Biederman, Mick, & Faraone, 2000). Throughout the development of the individual with ADHD, the heterogeneity of symptoms increases, and the ADHD symptoms evolve (Schmidt & Petermann, 2009; Sobanski et al., 2008). In general, symptoms of inattention remain stable in the development from childhood to adulthood (emerging adulthood) while symptoms of hyperactivity and impulsivity decrease or evolve into internal restlessness (Biederman et al., 2000; DuPaul et al, 1997; DuPaul et al, 1998; Sobanski et al., 2008). As a result, the consequential functional and participation problems experienced by individuals in emerging adulthood (Arnett, 2000) may differ considerably from insights reported for childhood.

Concerning education, this change in symptoms throughout different phases in life and the related challenges in terms of functioning and participation, leads automatically to a more

focused shift from primary to secondary education and more recently to higher or post-secondary education. Three to 7% of the students in higher education are diagnosed with ADHD (DuPaul et al., 2001; Lee, Oakland, Jackson, & Glutting, 2008). Evidence suggests that these students are less likely to attend higher education, are more likely to drop out of higher education without a degree and repeat classes more often than students without ADHD. They also have lower grade point averages and are more likely to be on academic probation compared to their peers (Barkley, Fischer, Smallish, & Fletcher, 2006; Antshell et al., 2011; Heiligensten, Gunther, Levy, Savino, & Fulwiler, 1999; Trout, Lienemann, Reid & Epstein, 2007; Seidman, 2006; Wilens, Biederman, & Spencer, 2002; Wolraich et al., 2005). Up until now, research on students with ADHD in higher education has mainly surveyed the academic skills, psychological problems and comorbidities without taking into account the environmental characteristics. However, according to the disability creation process (Fougeyrollas, 1995) the academic dysfunction displayed by students with ADHD might just as well be interpreted as a mismatch between characteristics of the higher education environment and characteristics of the individual student with ADHD.

The disability creation process described by Fougeyrollas (1995) states that the problem or disability always occurs in interaction with the environment. This framework forms the base of the UN Convention on the Rights of Persons with Disabilities (2006) that is ratified in more than 100 countries. As a result of this ratification, the UN Convention has been implemented in several national acts. The UN Convention on the Rights of Persons with Disabilities (2006) states that institutions of higher education are required to install and provide reasonable adjustments or accommodations for students with disabilities. These efforts are yielded to "*neutralize or reduce the specific functions and failure to increase the chances to participate in higher education*" (Art. 2, UN Convention of the Rights of Persons with Disabilities, 2006). Here, the emphasis is not only placed on the person with the

disability or ADHD, but rather on the individual's functioning and participation in interaction with the environment.

To our knowledge, no review has used this framework to provide an overview of the literature on students with ADHD in higher education. If we expect the reasonable accommodations to both effectively and efficiently neutralize and reduce functional and participation problems of students with ADHD, a review on this topic using an environment by person framework is necessary. Therefore, to fully grasp every aspect, we conducted a review on functioning and participation of students with ADHD in higher education according to the International Classification of Functioning, Disability and Health (ICF; World Health Organization [WHO], 2001). The ICF framework organizes and describes information on functioning and disability. It provides a standard language and a conceptual basis on the definition and measurement of health and disability (WHO, 2001). It is often used to describe and map various groups of disabilities. The framework is divided into two categories, namely human functioning and environmental and personal factors. Within the first category, the ICF discriminates three components of functioning, namely "body functions and structures", "activities" and "participation" (*Figure 1*). These three components of functioning interact with each other, the environmental and personal factors, and the disability of the person. Through this interaction, the barriers and facilitators on the functioning and participation of students in higher education will become clear. This way support can respond more efficiently and effectively to these barriers and facilitators.

Insert figure 1 here

In summary, we will perform a systematic literature review addressing the following research question: How do students with ADHD function and participate in higher education and

which difficulties can occur in the interaction between students with ADHD and the context of higher education?

Methods

Search strategy

A comprehensive search was performed in order to identify relevant articles with regard to the functioning and participation of young adults with ADHD in higher education. In June 2014, two researchers (EE, DJ) searched the following most frequently used electronic databases for educational research: MEDLINE (PubMed), EMBASE, CINAHL and ERIC. The search was limited to articles published from the first of January 2000 up to the first of June 2014, in an attempt to exclude articles containing outdated results. The search strategy was built using four concepts: “young adults”, “ADHD”, “ICF-components” and “higher education”. Each concept was defined by using multiple terms (both MeSH and free text words). All search terms related to one concept were combined using the Boolean operator ‘OR’ and these search strings then were combined using the Boolean operator 'AND'. The full MEDLINE search strategy, which was adapted for all other electronic database searches, is available as an online file (http://ppw.kuleuven.be/home/english/research/mesrg/documents/paper-supplements). In addition, we searched reference lists of relevant publications to identify other articles.

Study selection

The retrieved documents were screened, by two researchers independent of each other, as to whether they fulfilled the following inclusion criteria; 1) the document should address

participants diagnosed[1] with ADHD, either confirmed by the psychological services of the school using structured interviews and dimensional scales, by certificate or by an dimensional scale of self-reported symptoms, 2) the document should report on students (aged 18-25 years) or should at least contain 90% of college student participants and, 3) the document should address symptoms or ICF-components with regard to higher education (e.g., academic functioning, working memory, adjustment,…). We defined higher education as an optional final stage of formal learning that occurs after secondary education at a university college or university and can also be called post-secondary education.

Articles were excluded when; a) there was no reference to the participant's diagnosis, or there was only a reference to ADHD related symptoms without a diagnosis, b) there was no reference to the participants' age, c) the article focused only on the validation of screening tools or interventions (e.g., medication, behavioural training, social skills training) and d) the articles were book chapters, letters, case studies, (research) reports, newsletters articles, non-peer reviewed articles and dissertations that were not original research. Given the minimal amount of research conducted in the area of academic functioning of students with ADHD in higher education, we decided to also include reviews or literature studies, published in 2000 or later, containing primary studies published before 2000, and that provided relevant insights that we could not validate in original research reports from 2000 onwards.

Firstly, after the comprehensive search, the list of citations was unduplicated using Endnote. Secondly, two researchers (EE, DJ) reviewed all article titles, independently, in order to determine the eligibility of the articles (see supplemental file 2 Flow chart,

[1] In most studies participants were asked whether they were currently diagnosed with ADHD and classified based on their responses. Because of the fact that surveys are completely anonymous, the accuracy of students' self-report diagnostic status could sometimes not be verified via diagnostic interview.

http://ppw.kuleuven.be/home/english/research/mesrg/documents/paper-supplements). Thirdly, if the eligibility was not clear from the title alone, the abstract was independently screened by the two researchers. Finally, a full text assessment based on the inclusion criteria of all potentially relevant articles was performed by the same researchers. Disagreements between reviewers were resolved by discussion. Both reviewers approved the final selection.

Quality assessment and data extraction

The quality of the included studies was assessed according to the Cochrane Handbook for systematic reviews of Interventions (Higgens & Green, 2011, www.cbo.nl, Shea, et al., 2007). Two reviewers independently assessed the methodological quality of the included articles (EE, DJ). The items were scored using '-', '+', 'not clear' and 'not applicable' and obtained a degree (A,B,C,D) accompanying their level of methodological quality as depicted in Table 1, supplemental file 3 (http://ppw.kuleuven.be/home/english/research/mesrg/documents/paper-supplements).

Data extraction was carried out using a standard form, which was piloted beforehand by one reviewer (EE). The two researchers (EE, DJ) performed the data extraction independently, which was fully cross checked by both researchers. The following data was extracted: general characteristics of the study (first author, year of publication, country), methodological features (study design, sample size), specific characteristics (instruments, outcome measures) and the results of the studies. Study characteristics are depicted in Table 2, supplemental file 4.

Results

In our comprehensive search we found 779 unduplicated articles. In addition, we searched reference lists (of the full-text assessment) for relevant publications and identified another 13 articles. We excluded 635 articles based on title and abstract. The remaining 55 articles were assessed by full-text screening. From these 55 articles, we excluded another 33 articles (the

list of excluded articles and reason for exclusion is available as a supplemental file 5, http://ppw.kuleuven.be/home/english/research/mesrg/documents/paper-supplements). We included 22 articles in our systematic literature review.

The results are summarized by ICF-components “body functions and structures”, “activities”, “participation”, “environmental factors” and “personal factors”. The graphical summary of results is depicted in Figure 2, results are summarized in Table 3 supplemental file 6. When we use comparative terms (e.g., more, less) in this results section, we always refer to reported differences between students with ADHD and without ADHD (or without disability).

In this review we take into account the methodological quality of the included studies. We based our vocabulary clause on the quality of the primary studies, which could also be confirmed by conclusions drawn from included reviews. As a result, we can only make statements about the reliability of primary studies and therefore cannot give a qualitative judgment, in the form of a vocabulary clause, in the case of a review. When the results of the primary studies are complemented or confirmed by a conclusion of an included review we will indicate this by stating "This finding is confirmed by review X...”

Body functions and structures

For the first component, we found 16 articles of which one was rated as of high quality[2] (Weyandt & DuPaul, 2006). Ten articles were rated as medium quality (Linterman &

[2] Methodological quality assessment. High quality score (A1 and A2) for this level of evidence, the results will be discussed with the following nuance “it has been shown that…”

Medium quality score (B) for this level of evidence, the results will be discussed with the following nuance “it is plausible or likely that…” or “there are indications of …”

Low quality score (C and D) for this level of evidence, the results will be discussed with the following nuance “it seems likely that …” or “Researchers believe that …”

Weyandt, 2001; Weyandt, Iwaszuk, Fulton, Ollerton, Beatty, Fouts, Schepman & Greenlaw., 2003; Rabiner, Anastopoulos, Costello, Hoyle & Swartzwelder, 2007; Abramovitch & Schweiger, 2009; Gropper & Tannock, 2009; Nelson & Gregg, 2012; Prevatt, Proctor, Baker, Garret & Yelland, 2011; Kearnes & Ruebel, 2011; Buchanan, 2011; Prevatt, Proctor, Best, Walker & Taylor, 2011; Prevatt, Dehili, Taylor & Marshall, 2012), followed by four articles of low methodological quality (Meaux, Green & Broussard, 2009; three reviews Bradshaw & Salzer, 2003; Gilbert, 2005; Weyandt & DuPaul, 2008).

With regard to the first ICF-component "body functions and structures", we found in two reviews that students with ADHD have poorer **executive functions** (Bradshaw & Salzer, 2003; Weyandt & DuPaul, 2008). **Inhibition** is one of the main executive functions that students with ADHD experience problems with. Researchers believe that students with ADHD are unable to **control immediate, prepotent responses** which results in difficulties with inhibition **of actions and anxious**, **intrusive and worrisome thoughts** and, more generally, in difficulty with **regulating emotions** (Weyandt, 2003; Abramovitch & Schweiger, 2009; confirmed by the review of Bradshaw & Salzer, 2003). The review of Gilbert (2005) concludes that students with ADHD can **blur out answers** before the question is fully posed and have **difficulty awaiting their turn**.

Moreover, there are indications that, because of the difficulties regarding inhibition, students with ADHD can encounter both **auditory-verbal** and **visual-spatial working memory deficits** (Linterman, 2001; Gropper & Tannock, 2009). Researchers believe that these students can experience more difficulties with **information processing**, **self-control** and **goal-directed behaviour** and **impulsivity** (Meaux et al., 2009; confirmed by the review of Weyandt & DuPaul, 2008). We found in the review of Bradshaw and Salzer (2003) that students with ADHD can experience problems with **adapting to various changing situations**

and therefore have problems with **cognitive flexibility.** Finally, with respect to higher executive functions, the review of Weyandt and DuPaul (2006) found that students with ADHD can encounter **poor time management** and **organisation skills**, can have difficulty **planning and organising study time** and **using time and resources efficiently** (Meaux et al., 2009; confirmed by the reviews of Bradshaw & Salzer, 2003; Gilbert, 2005; Weyandt & DuPaul, 2006; Weyandt & DuPaul, 2008;). For students with ADHD, this lack of organisation and planning skills is one of the largest problems with regard to executive functioning in higher education because the external control of parents or teachers disappears and students need to manage these skills on their own for the first time.

Furthermore it seems that students with ADHD experience **difficulties with concentration** and **staying focused** (Meaux et al., 2009; confirmed by results of the reviews of Gilbert, 2005; Weyandt & DuPaul, 2008). Researchers believe that **sustaining attention** and **managing distraction** can be problematic for these students (Meaux et al., 2009; confirmed by conclusions drawn from the review of Bradshaw & Salzer, 2003; Gilbert, 2005). Because of these difficulties with sustained attention, students with ADHD do not give **close attention to detail** and therefore make **careless mistakes** (review of Gilbert, 2005). Researchers also indicate that students with ADHD need **more time to complete tasks and** may have difficulties **starting and completing tasks or assignments** and **complying with deadlines** (Meaux et al., 2009; Prevatt et al., 2010; Prevatt et al., 2012a; confirmed by the review of Bradshaw & Salzer, 2003; Gilbert, 2005).

Students with ADHD may experience **hyperactivity** (Meaux et al., 2009). We found in the review of Gilbert (2005) that they have problems with **staying seated in classes**, during exams or when writing papers and **move their hands or feet or squirm frequently** in their seats. However, as stated in the introduction, previous literature suggests that symptoms of hyperactivity can evolve during adolescence and adulthood. Because of this evolution, it is

possible that students with ADHD do not experience problems with hyperactivity. Hyperactivity can evolve into **internal restlessness** (Weyandt et al., 2003). Researchers believe that students with ADHD can encounter more problems with internal restlessness and having difficulty with relaxing because of this developmental change in symptoms (Weyandt et al., 2003; confirmed by the results of the review of Bradshaw & Salzer, 2003).

In addition, it seems likely that students with ADHD also **exhibit lower motivation** and have **lower self-control** or **self-disciplinary behaviours** (Meaux et al., 2009; confirmed by the review of Weyandt & DuPaul, 2008). Sonuga-Barke and colleagues (1992) stated that that individuals with ADHD are more likely to **choose smaller, immediate rewards** rather than larger, delayed rewards. In the dual pathway model of ADHD, this is conceptualized as the "Shortened reward gradient" (Sonuga-Barke, 2002). Next to these motivational problems, we found in two reviews that students with ADHD may have trouble **remembering things** such as subject matter or various items from **orientation** (Bradshaw & Salzer, 2003; Gilbert, 2005). In terms of sleep, researchers believe that students with ADHD can experience more **difficulty sleeping** and **getting up on time** (Meaux et al., 2009). Finally, students with ADHD can also encounter problems with **following spoken directions** and they often **lose things** (reviews of Bradshaw & Salzer, 2003; Gilbert, 2005).

Buchanan and colleagues (2011) found that these students have a **lower score on overall psychological well-being** and may experience more **negative emotions** (Buchanan, 2011; Keanes & Ruebel, 2011; confirmed by the review of Weyandt & DuPaul, 2008). Researchers do not agree on the fact that students with ADHD encounter **more anxiety and depressive symptoms** and experience a greater **psychological distress**, more **somatisation** and more difficulties with **monitoring personal stress** (Rabiner et al., 2007; Prevatt et al., 2012a; confirmed by the results of the review of Gilbert, 2005; Weyandt & DuPaul, 2008), because others showed that students with ADHD do not experience more problems with **depression**

and anxiety in comparison with their peers (Nelson & Gregg, 2012 and found in the review of Weyandt & DuPaul, 2006). We did found in a review of Weyandt & DuPaul (2008) that students with ADHD are more likely to have **lower self-esteem**.

Activities

For the second component, we found five articles of which one is of high quality (Weyandt & DuPaul, 2006). All four other articles are of low methodological quality (Meaux et al., 2009; three reviews Bradshaw & Salzer, 2003; Gilbert, 2005; Weyandt & DuPaul, 2008)

Research shows that students with ADHD can have **poor study skills** and **test strategies** and can have difficulties with **self-testing** (Meaux et al., 2009; confirmed by the reviews of Gilbert, 2005; Weyandt & DuPaul, 2006; Weyandt & DuPaul, 2008). One review concluded that they can also have poor **problem solving skills** and may experience problems with **setting outcome goals** (Bradshaw & Salzer, 2003). We found two reviews that suggest that students with ADHD are mostly unable to **prioritize and select** main ideas from side issues (Bradshaw & Salzer, 2003; Weyandt & DuPaul, 2008).

Participation

For the third component we found seven articles of which one is of high quality (Weyandt & DuPaul, 2006). Two articles were assessed as of medium quality (Rabiner et al., 2007; Kaminski, Turnock, Rosen & Laster, 2006), followed by four articles of low methodological quality (Meaux et al., 2009; three reviews Bradshaw & Salzer, 2003; Gilbert, 2005; Weyandt & DuPaul, 2008).

With regard to the third ICF-component “participation”, we found a review (Weyandt & DuPaul, 2008) that states that students with ADHD can have problems with **social relationships**. Students in higher education with the inattentive subtype differed from their

peers **hetero-social functioning**. Studies on the inattentive type show that this group also reported being **less comfortable** in assertive relevant situations and female confederates. According to researchers, their impulsivity poses challenges in their social relationships (e.g., making impulsive decisions, frequently changing subject, mood swings) (Meaux et al., 2009). Two reviews (Gilbert, 2005; Weyandt & DuPaul, 2008) conclude that generally speaking, students with ADHD (all types) can have **poor social skills**, may have difficulties with **social functioning** and females with ADHD can show more **negative social behaviour** (e.g., mood swings, negative comments, hysterical outbursts) (Gilbert, 2005; Weyandt & DuPaul, 2008). This may have an impact on the participation in group work or collaboration with others. Because of their diagnosis, they are more likely to be **stigmatized** and are therefore **less often chosen as a partner for cooperation**. One review (Weyandt & DuPaul, 2006) found that they also can encounter problems with **accessing social support**. Other research suggests that students with ADHD do not significantly differ from the control group regarding **social satisfaction** and did not report greater **problems with relationships** than these students (Rabiner et al., 2007; confirmed by the review of Weyandt & DuPaul, 2006). Weyandt and DuPaul (2008) indicated that students in higher education in the ADHD combined type reported a significantly greater **sexual drive**.

In case of participation in higher education, three reviews found results on impaired academic achievement (Bradshaw & Salzer, 2003; Weyandt & DuPaul, 2006; Weyandt & DuPaul, 2008). Students with ADHD may show **lower grade point averages**, are more likely to be on **academic probation** and can show more **academic problems**. Kaminski and colleagues (2006) found that students who are less academically successful spend more time **using coping mechanisms** and therefore have less time to study. The review of Weyandt & DuPaul (2006) stated that they are also less likely to **attend and graduate from higher education** and they show high rates of **academic underachievement**.

Environmental factors

For the fourth component we found eight articles of which one is of high quality (Weyandt & DuPaul, 2006). Two articles were assessed as of medium quality (Upadhaya, Rose, Wang, O'Rourke, Sullivan, Deas & Brady, 2005; Rabiner et al., 2007), followed by five articles of low methodological quality (Meaux et al., 2009; Skinner et al., 2004; three reviews Bradshaw & Salzer, 2003; Gilbert, 2005; Weyandt & DuPaul, 2008).

The ICF-component "environmental factors" can be found in different, sometimes contradictory studies. On the one hand, literature states that students with ADHD can experience more problems with **substance abuse** (e.g., alcohol, illicit drugs) or **addictive behaviours** (Upadhaya et al., 2005; confirmed by the review of Gilbert, 2005). On the other hand, some researchers demonstrate that students with ADHD do not experience more problems with **alcohol consumption** than students without ADHD (Upadhaya et al., 2005; Rabiner et al., 2007; confirmed by the review of Weyandt & DuPaul, 2008). Next to alcohol consumption, students with ADHD are likely to have smoked cigarettes 2.5 to 3.5 times more in the last 30 days than students without ADHD (Upadhaya et al., 2005; Rabiner et al., 2007). In case of other substance abuse, research shows that students with ADHD are more likely use **more marijuana** (Upadhaya et al., 2005), especially when these students take medication for his disorder (Rabiner et al., 2007). However, one review suggests that students with ADHD do **not have problems with substance use** (Weyandt & DuPaul, 2006) and do not use more marijuana than students without ADHD (Rabiner et al., 2007).

Meaux (2009) found some supportive factors that helped students in higher education cope with ADHD, such as being accountable, learning from consequences, setting alarms and reminders, taking/using central nervous system stimulants, engaging in self-talk, removing distractions, the importance of self-advocacy, staying busy, and scheduling (Skinner et al.,

2004; Meaux, 2009). Furthermore, strong support systems, perseverance, and the ability to set goals were described as playing a major role in the students' ability to successfully navigate in higher education settings (Skinner et al., 2004). Skinner and colleagues (2004) also showed that academic accommodations and course alternatives were perceived as extremely important contributors to the student's success.

Next to these factors there are some other supportive factors in the broader environment, such as parents, friends, teachers/tutors, and disability services who can help students cope with ADHD challenges (e.g., daydreaming, being easily distracted, procrastination, lack of organization, losing things, misplacing things and forgetting appointments). Apart from these helpful factors, researchers also found factors that hinder students' coping with ADHD and managing challenges in everyday life. For example, the lack of knowledge of students with ADHD about services (e.g., housing service, student counselling, study aid) and sources of support, the difficulties they can experience with course expectations (e.g., deadlines, deriving goals from paper instructions, managing main and detailed study materials) of the missed opportunities in higher education (Meaux, 2009; confirmed by the review of Bradshaw & Salzer, 2003). Skinner and colleagues (2004) show that very little is done by school psychologists to translate the results of assessments and evaluations into information usable for educational programming.

Personal factors

For the last component we found six articles of which one is of high quality (Weyandt & DuPaul, 2006), three of medium methodological quality (Barnard-Brak, 2010; Nelson & Gregg, 2012; Semrud-Clikeman & Harder, 2010) and two articles are of low methodological quality (Meaux et al., 2009; the review of Gilbert, 2005).

Comorbidities are classified as personal factors. The literature shows that students with ADHD are more likely to have **learning disabilities** and **poorer reading skills** (Meaux et al., 2009; confirmed by the review of Gilbert, 2005). Semrud-Clikeman and Harder (2010) found that students with ADHD do not differ from students without ADHD on measures of writing skills. Besides learning disabilities, the review of Weyandt & DuPaul (2006) suggests that students with ADHD are more likely to have an **obsessive compulsive disorder**, **paranoid ideation** and **psychoticism.** Nelson and Gregg (2012) found that students with ADD/H (hyperactive type) demonstrate more behavioral conduct problems than students with ADD/WO (without hyperactivity). The ADD/WO subgroup was found to be more likely experience symptoms of anxiety and depressing than the ADD/H group (Nelson & Gregg, 2012). In addition, anxiety disorders and mood disorders are also common in young adults and ADHD. Within academic functioning these anxiety disorders can take form as fear of failure. Barnard-Brak (2010) and colleagues show that students who report having visible disabilities (e.g., motoric disability) have more positive attitudes toward requesting accommodations compared with students who report having hidden disabilities such as ADHD.

Insert figure 2 here

Discussion

We conducted this review because, to our knowledge, no research has brought together these insights as an adjustment problem between the student with ADHD and the environment. Previous research stated that there are no regulations on how accommodations in higher education should be selected, organized and implemented (e.g., Smith, 2007). Institutions of higher education have developed a range of educational accommodations following the ratification of het UN Convention on the Rights of Persons with Disabilities (2006). Up until

now, these efforts do not lead to an increase of the academic success rate of students with disabilities (such as ADHD). If we want to support students with ADHD and want to implement effective accommodations in higher education, it is important to analyze all critical student factors (e.g., body functions, personal factors) as well as environmental characteristics as stated by the ICF-framework. To this end, we reviewed 22 articles examining students with ADHD.

With regard to the ICF component “body functions and structures”, students with ADHD can encounter problems with inattentiveness and distractibility and they have poor executive functions. According to Barkley (1997), these poor executive functions, for example emotion regulation and working memory deficits, arise from the inability to inhibit actions as well as emotions. Executive function deficits can play a large role in the academic functioning and performance of students with ADHD because of the importance of these functions in this developmental phase. Students with ADHD can also encounter problems with internal restlessness and motivation. These findings are in line with previous research (Weyandt et al., 2003).

With respect to the ICF components “activities” and “participation”, students with ADHD often have poor study skills, study strategies and problem solving skills. In addition, our review suggests that these students are unable to prioritize and select main ideas from side issues. They can also experience social problems such as poor social functioning and negative social behavior. We agree with Lebowitz (2013) that these social problems can enhance the stigma of peers and can hinder specific activities of students with ADHD in higher education such as making friends or finding peers for a joined assignment.

Results concerning the components “environmental factors” show that students use environmental support like setting alarms and reminders, and removing distractions. Research

also showed academic accommodations and course alternatives are important contributors to the academic success of students with ADHD.

Finally, results on “personal factors” suggest that students with ADHD are at higher risk for comorbidities like learning disabilities and psychiatric disorders, for instance obsessive compulsive disorder. With regard to drugs, alcohol, and tobacco use, literature was inconsistent.

This review has some limitations. First of all, a lot of the primary studies that we found in our comprehensive search were conducted without any referral to the diagnosis or were about non-diagnosed students who report ADHD symptoms (cfr. exclusion criteria). This limitation was also found by Weyandt and DuPaul (2006). We can conclude that future research should investigate the obtained diagnosis of included students using the DSM criteria.

Secondly, primary studies included in this review often used a small sample size. This means that analyses could not be done at the level of subtype, gender, or other variables. Research included in this review studied the differences between the ADHD group and a control group, but often did not have decisive answers regarding the difference in functioning and participation between, for example, female and male students with ADHD or students with ADHD, predominantly inattentive type, students with ADHD, predominantly hyperactive-impulsive type, and students with ADHD, combined type. Further research should include a larger sample size in order to examine the differences of academic functioning and participation across different variables.

Thirdly, most of the studies included in the review were conducted in a cross-sectional design. This design limits the understanding of development and functioning of students with ADHD over the years. As stated in previous research, the symptoms of ADHD develop over the years. Students with ADHD also become more creative in dealing with the difficulties they

experience, which leads to a decrease or evolvement of these symptoms. In cross-sectional designs, this development is not exposed. Therefore, future research should focus on the trajectories of students with ADHD during all years of higher education, by using a longitudinal design.

Fourthly, in our comprehensive search we only found a small number of primary studies. In comparison with the population of children diagnosed with ADHD, students with ADHD in higher education are an understudied group and more research is needed to further investigate the academic functioning of students.

We found only one study of high quality (Weyandt & Dupaul, 2006) which was a systematic review. Sixteen other studies were of medium quality and were quantitative comparisons (Linterman & Weyandt, 2001; Weyandt et al., 2003; Upadhaya et al., 2005; Rabiner et al., 2008; Semrud-Clikeman & Harder, 2010; Abramovitch & Schweiger, 2009; Gropper & Tannock, 2009; Nelson & Gregg, 2012; Prevatt et al., 2011a; Kearnes & Ruebel, 2011; Buchanan, 2011; Prevatt et al., 2011b; Prevatt et al., 2012). The five remaining articles were literature studies or narrative reports that lacked detail on search method and procedure (Meaux et al., 2009; Bradshaw & Salzer, 2003; Skinner et al., 2004; Gilbert, 2005; Weyandt & DuPaul, 2008). Hannes, Lockwood and Pearson (2010) stated that the use of standard reporting templates for (literature) reviews would facilitate researchers in assessing whether or not authors have conducted their study according to the methodological state of the art. Which will enhance transparency and will make it easier to draw solid conclusions. A review seems of good methodological quality but when drawing conclusions based on the content, there is a lack of reliability because the reviews builds itself on the flaws of the primary studies. By taking into account this quality assessment in our review, we added a critical methodological assessment for the primary studies included en leave the quality assessment of the content in the reviews to their authors.

Implications for future research

We used the ICF-framework in our systematic literature review to delineate the broad spectrum of symptom dimensions in this group of students. It is notable that the results of this review cover the component “body functions and structures” well but information regarding the other four components is scarcer. Taking into account this remark, we can find important directions for future research. For instance, there should be more research on the activities and participation of students with ADHD with respect to the life as a student outside of the educational environment. Students often live in student residences away from their parents. They have to handle living alone as well as functioning at an academic level. Research on the activities and participation of students with ADHD in everyday life, for example housekeeping, grocery shopping, and recreation, is inexistent. In addition, we still lack insight in the effectiveness of environmental support. Research will have to determine which support will be effective under what (personal) circumstances, taking into account successful process and implementation factors (e.g., how much extra time to complete a task, where to be seated in a crowded examination room).

Implications for practice (student counsellors)

The symptoms of ADHD evolve from childhood to (young) adulthood. The knowledge regarding this developmental perspective and the functioning and participation of students with ADHD in higher education is Sometimes limited. However, such knowledge is needed to support students with ADHD more effectively and efficiently. Therefore, this literature review aimed to provide an overview of current knowledge for this specific population.

We emphasize that students with ADHD can experience different functional and participation problems in various life domains and that it is important to target these different domains simultaneously. We suggest to create an intervention pyramid, starting with basic intervention and specialising building its way up. As a baseline we recommend the use of the principles of the universal design for learning and a strategy to work on attitudes in the learning environment. Followed by a second layer were it is important to explore the individual problems of students with ADHD in higher education and why communication between the student with ADHD and student mentor is crucial. By using a full assessment-interview, the student mentor can explore the functional and participation problems of the student with ADHD. So that these mentors can take into account these individual differences when offering support to students with ADHD. Placed in to the top of the pyramid are psychosocial and pharmacological interventions outside higher education provided by professionals.

Concluding that by looking at the problems of students with ADHD, selection and implementation of accommodations should be adjusted to the specific characteristics of the individual student's functioning and participation problems to increase the efficiency and effectiveness of accommodations in higher education. It is important that this support is always adjusted based on the special (educational) needs of the student with ADHD and the possibilities within the environment of higher education, whereby every actor had his responsibilities.

In summary, this systematic literature review suggests that symptoms of students with ADHD are associated with increased risk of academic functioning problems. Furthermore, evidence suggests that research should take into account not only the skills of the student with ADHD, but the whole social and emotional functioning as well as the role of the environment. This

holistic approach is summarized in the completed ICF (figure 2). The evidence presented in this in this review is a starting point to investigate educational accommodations to counter academic functional problems in students with ADHD (e.g., the development of a checklist focused on allocation of accommodations for student mentors).

Acknowledgments

This review was performed as part of a research project on reasonable accommodations in higher education, supported by the Education Development Fund of KU Leuven Association.

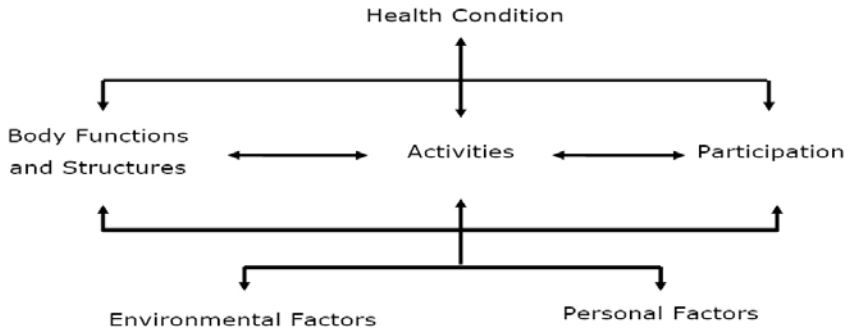

Figure 1. Framework of the International Classification of Functioning, Disability and Health (WHO, 2001)

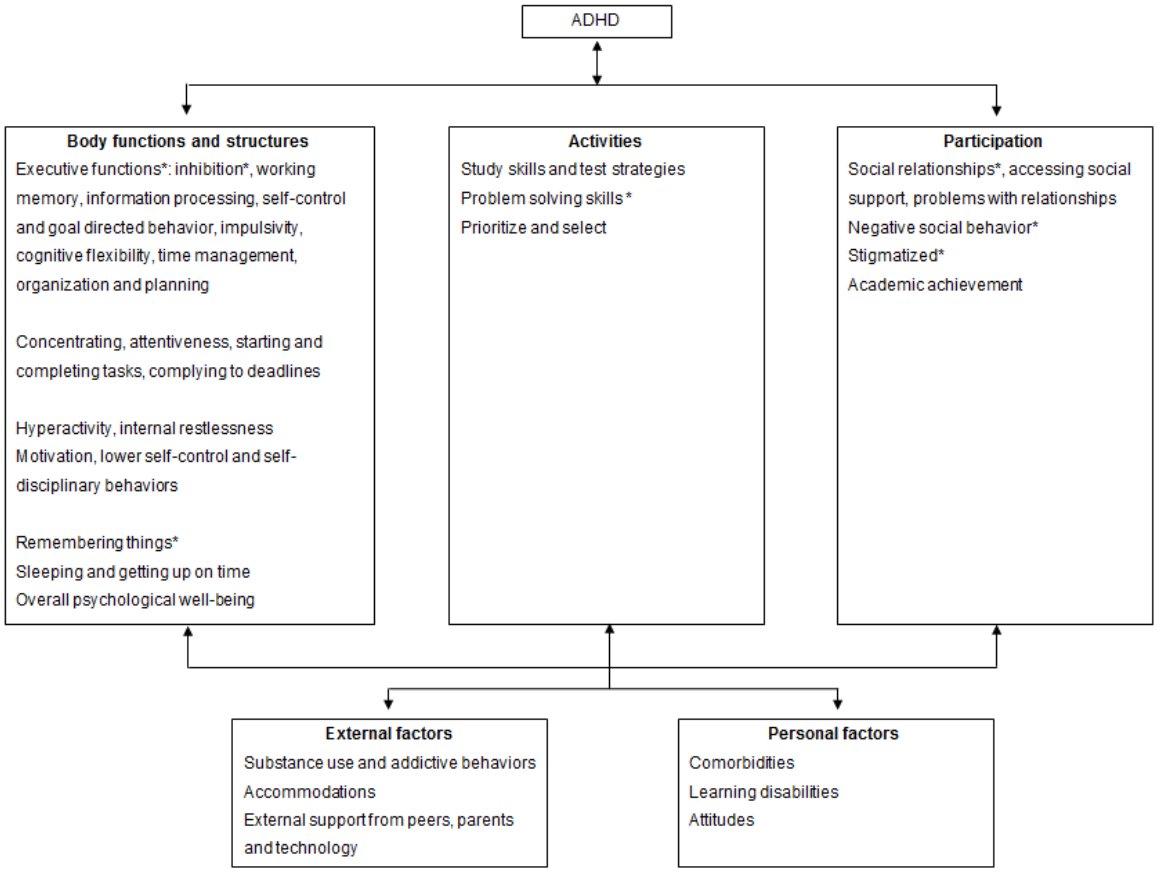

Figure 2. Functioning and participation of students with ADHD in higher education according to the ICF framework. (*) Was used when this information was found only in a review or literature study.

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